

**PRELIMINARY AMENDMENT**  
**U.S. Appln No. 10/089,547**

**IN THE CLAIMS:**

**Please enter the following amended claims:**

Claim 1. Axial magnetic bearing apparatus in which a rotary disc made of a magnetic material is fixedly attached to a rotating shaft, while a pair of electromagnetic stators in each of which a ring-like electromagnetic coil for generating magnetomotive force is inserted into a coil slot are fixed to casings respectively so as to be located on opposite sides of said rotary disc with suitable very small distances, and on the basis of an output signal of a displacement sensor for measuring axial displacement of said rotating shaft, magnetic attraction force is made to act between said rotary disc and each of said electromagnetic stators so as to bear said rotating shaft in a target position distant from said electromagnetic stators and in non-contact therewith, said axial magnetic bearing apparatus being characterized in that a deep groove for forming an air layer having large magneto-resistance is provided in a vicinity of an axial center of said rotary disc so as to extend from an outer circumferential portion of said rotary disc toward said rotating shaft, and a bottom portion of said deep groove is located to be closer to said rotating shaft than inside magnetic pole teeth of said electromagnetic stators.

Claim 2. Axial magnetic bearing apparatus according to Claim 1, characterized in that said deep groove is formed all over the outer circumference of said rotary disc.

Claim 3. Axial magnetic bearing apparatus in which a rotary disc made of a magnetic material is fixedly attached to a rotating shaft, while a pair of electromagnetic stators in each of which a ring-like electromagnetic coil for generating magnetomotive force is inserted into a coil slot are fixed to casings respectively so as to be located on opposite sides of said rotary disc with suitable very small distances, and on the basis of an output signal of a displacement sensor for measuring axial displacement of said rotating shaft, magnetic attraction force is made to act between said rotary disc and each of said electromagnetic stators so as to bear said rotating shaft in a target position distant from said electromagnetic stators and in non-contact therewith, said

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thrust magnetic bearing apparatus being characterized in that fan-shaped through holes for forming an air layer having large magneto-resistance are provided in a vicinity of an axial center of said rotary disc so as to extend from an outer circumferential portion of said rotary disc to said rotating shaft, while walls of rotary disc pieces located on axially opposite sides of said through holes are formed as solid walls having no through hole axially.

Claim 4. Axial magnetic bearing apparatus in which a rotary disc made of a magnetic material is fixedly attached to a rotating shaft, while a pair of electromagnetic stators in each of which a ring-like electromagnetic coil for generating magnetomotive force is inserted into a coil slot are fixed to casings respectively so as to be located on opposite sides of said rotary disc with suitable very small distances, and on the basis of an output signal of a displacement sensor for measuring axial displacement of said rotating shaft, magnetic attraction force is made to act between said rotary disc and each of said electromagnetic stators so as to bear said rotating shaft in a target position distant from said electromagnetic stators and in non-contact therewith, said thrust magnetic bearing apparatus being characterized in that a distance between a surface of said rotary disc existing in a position not opposed to any one of an inside magnetic pole tooth and an outside magnetic pole tooth of corresponding one of said electromagnetic stators and a surface of said corresponding electromagnetic stator opposed to said surface of said rotary disc is formed to be larger than a distance between a surface of said rotary disc existing in a position opposed to each of said inside magnetic pole tooth and said outside magnetic pole tooth of said corresponding electromagnetic stator and a surface of said corresponding electromagnetic stator opposed to said surface of said rotary disc.

Claim 5. Axial magnetic bearing apparatus in which a rotary disc made of a magnetic material is fixedly attached to a rotating shaft, while a pair of electromagnetic stators in each of which a ring—like electromagnetic coil for generating magnetomotive force is inserted into a coil slot are fixed to casings respectively so as to be located on opposite sides of said rotary disc with suitable very small distances, and on the basis of an output signal of a displacement sensor

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for measuring axial displacement of said rotating shaft, magnetic attraction force is made to act between said rotary disc and each of said electromagnetic stators so as to bear said rotating shaft in a target position distant from said electromagnetic stators and in non-contact therewith, said thrust magnetic bearing apparatus being characterized in that slits large enough to increase radial magneto-resistance are provided at several places in outer circumferential portions of said electromagnetic stators.

Claim 6. Axial magnetic bearing apparatus in which a rotary disc made of a magnetic material is fixedly attached to a rotating shaft, while a pair of electromagnetic stators in each of which a ring-like electromagnetic coil for generating magnetomotive force is inserted into a coil slot are fixed to casings respectively so as to be located on opposite sides of said rotary disc with suitable very small distances, and on the basis of an output signal of a displacement sensor for measuring axial displacement of said rotating shaft, magnetic attraction force is made to act between said rotary disc and each of said electromagnetic stators so as to bear said rotating shaft in a target position distant from said electromagnetic stators and in non-contact therewith, said thrust magnetic bearing apparatus being characterized in that outer circumferential grooves for forming an air layer having large magneto-resistance are provided respectively in portions of outside magnet pole teeth of said electromagnetic stators not opposed to said rotary disc, so as to extend axially from a side where said rotary disc is located.

Claim 7. Axial magnetic bearing apparatus in which a rotary disc made of a magnetic material is fixedly attached to a rotating shaft, while a pair of electromagnetic stators in each of which a ring-like electromagnetic coil for generating magnetomotive force is inserted into a coil slot are fixed to casings respectively so as to be located on opposite sides of said rotary disc with suitable very small distances, and on the basis of an output signal of a displacement sensor for measuring axial displacement of said rotating shaft, magnetic attraction force is made to act between said rotary disc and each of said electromagnetic stators so as to bear said rotating shaft in a target position distant from said electromagnetic stators and in non—contact therewith, said

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thrust magnetic bearing apparatus being characterized in that an outer diameter of each of said electromagnetic stators is formed to be substantially as large as an outer diameter of said rotary disc, and a ring made of a non-magnetic material having a radial thickness large enough to form a layer with large magneto-resistance is interposed between an outer circumferential portion of each of said electromagnetic stators and an inner circumferential portion of corresponding one of said casings to which said electromagnetic stator is attached.

Claim 8. Axial magnetic bearing apparatus according to in which a rotary disc made of a magnetic material is fixedly attached to a rotating shaft, while a pair of electromagnetic stators in each of which a ring—like electromagnetic coil for generating magnetomotive force is inserted into a coil slot are fixed to casings respectively so as to be located on opposite sides of said rotary disc with suitable very small distances, and on the basis of an output signal of a displacement sensor for measuring axial displacement of said rotating shaft, magnetic attraction force is made to act between said rotary disc and each of said electromagnetic stators so as to bear said rotating shaft in a target position distant from said electromagnetic stators and in non-contact therewith, said thrust magnetic bearing apparatus being characterized in that a collar made of a non-magnetic material for relatively positioning attachment of said pair of electromagnetic stators is provided between said pair of electromagnetic stators.